London, 29th March 2017

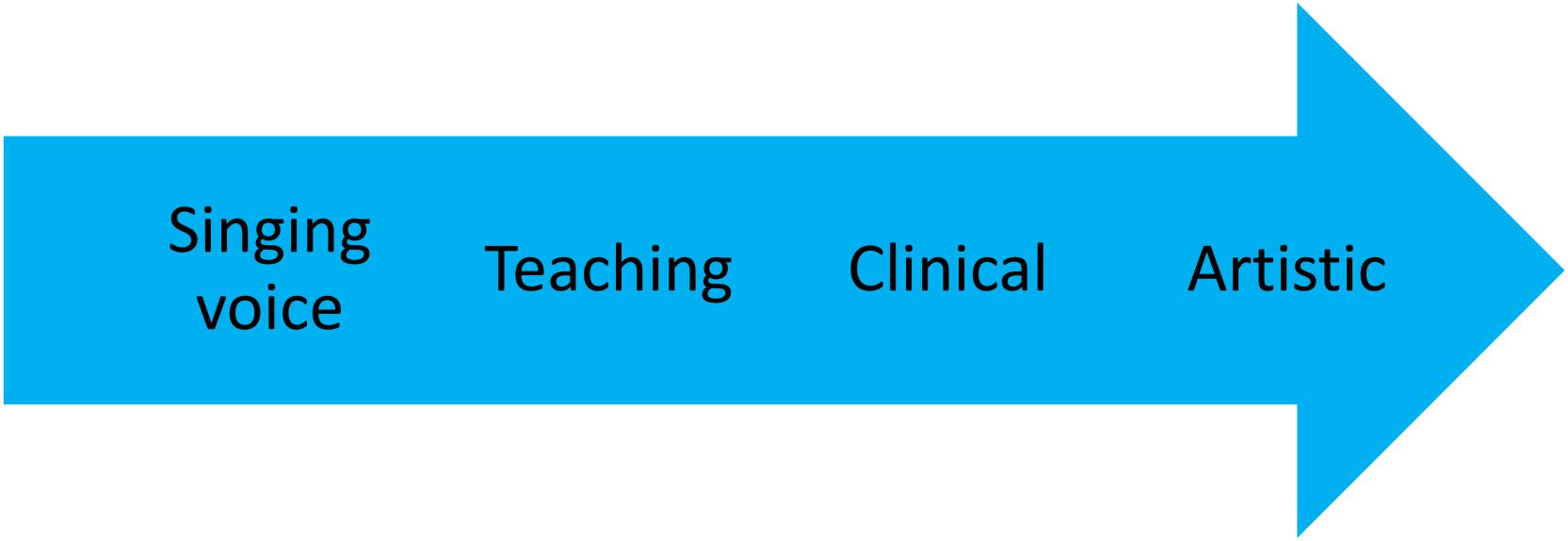
EAVOCZ

Appreciation Rating Scale for the Singing Voice

Soraia Ibrahim, Ana Mendes & Inês Vaz

Auditory-perception (AP)

- Ability to identify, interpret and attach meaning to sound



Orlikoff *et al*., 1999

Bibliographic review

	Scale	Scores
1. Auditory-Perceptual Rating Instrument for Operatic Singing Voice (APRIOSV) [1]	EAI VAS	0 - Poor or severe tension 10 - Excellent or tension free
2. Relating objective measurements to expert evaluation of voice quality in western classical singing: critical perceptual parameters (ROMWC) [2]	Ordinal	1 (poor) - 10 (excellent)
3. Auditory-perceptual voice evaluation protocol (APVEP) [3]	Categorial	Categories
4. Perceptual Findings on the Broadway Belt Voice (PFBBV) [4]	EAI	Yes/No 0 (poor) – 10 (strong) 60 (poor) - 100 (elite)

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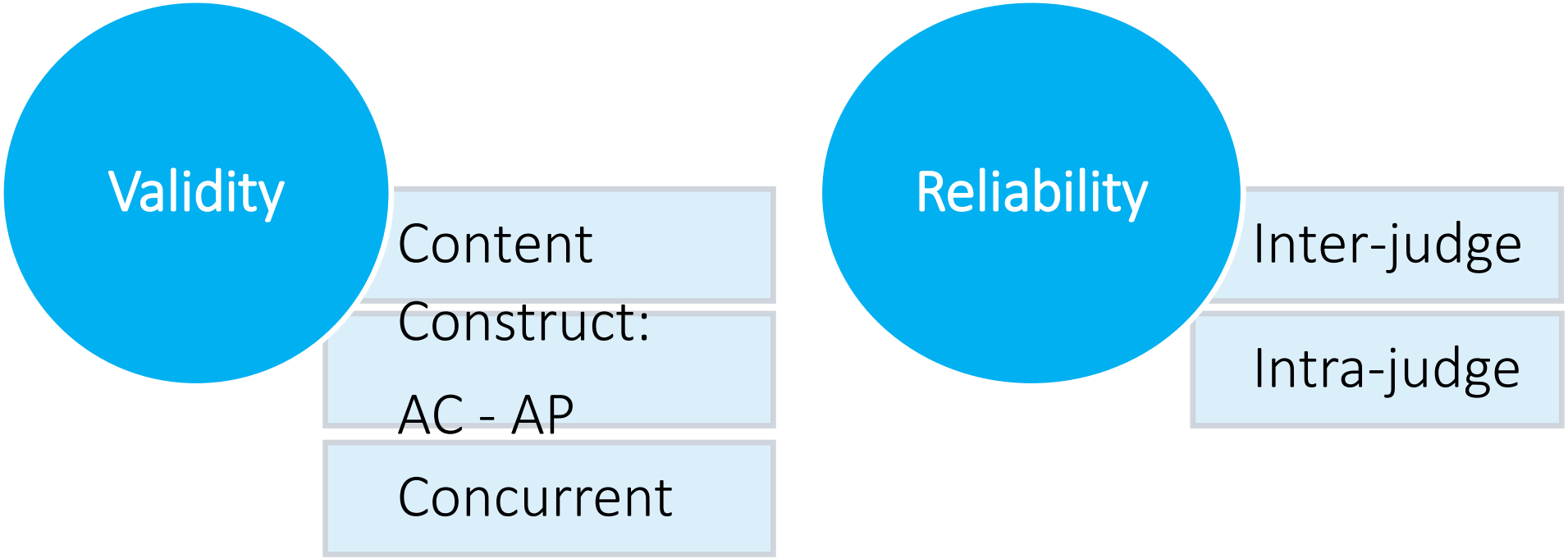
EAVOCZ relevance

- Standardized terminology
- Objective measures of singing voice
- Reliable and valid instrument

Objectives: Psychometric criteria



Methods: Content validity

1. Pilot study with

12 judges:
3 ST
3 SLT
3 FS
3 NL

2. Content

3. Form

Thematic analysis

Methods

Contruct validity
Reliability

Methods

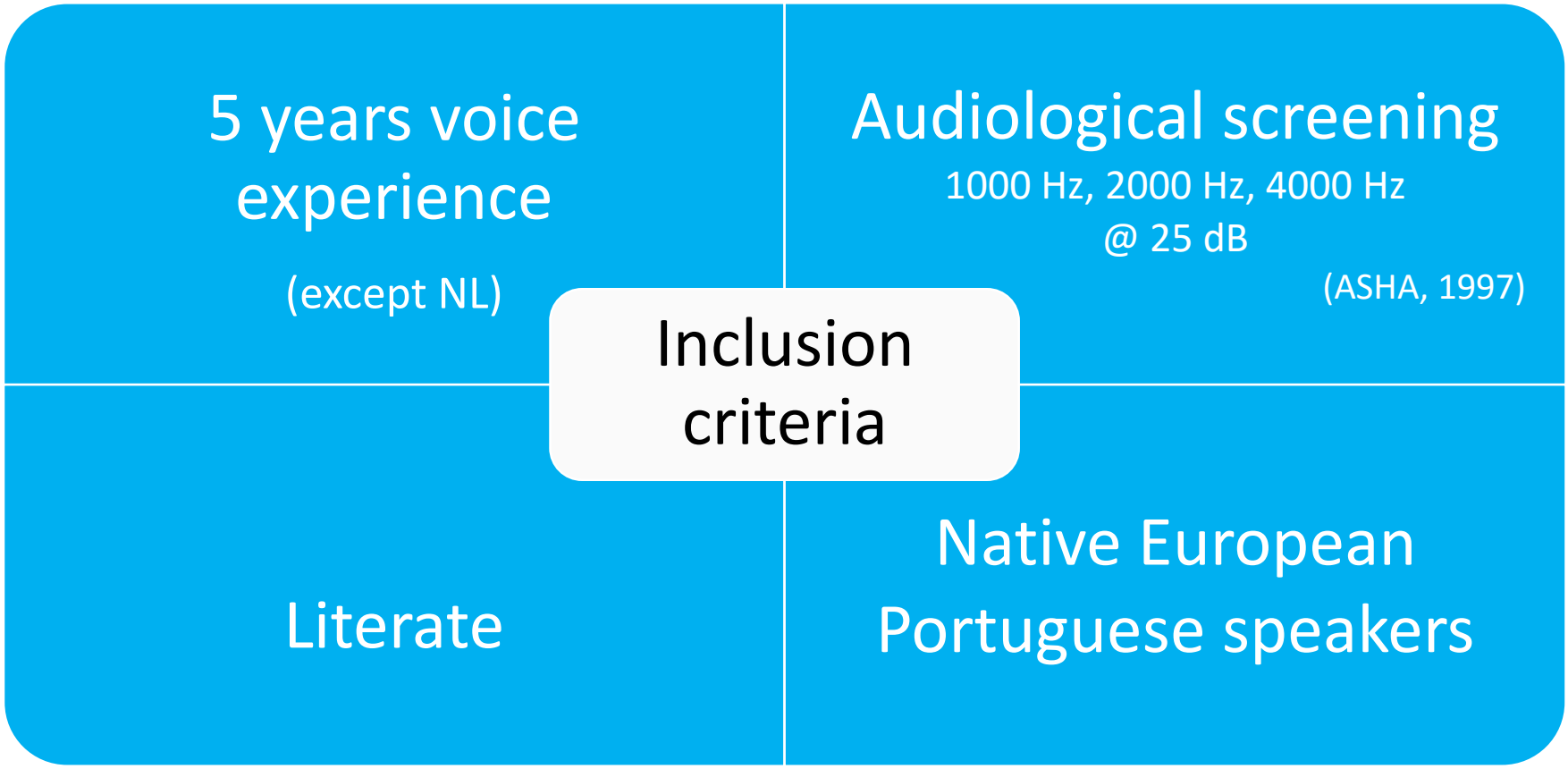
Subjects: 40 listners

	Gender	N	Age	Experience (yrs)
			$\bar{X}$	$\bar{X}$
ST	M	4	38	17
	F	6	53	30
SLT	M	2	33	9
	F	8	41	15
FS	M	3	39	24
	F	7	37	13
NL	M	3	30	0
	F	7	42	0
Total		40		

ST=singing teachers; SLT=speech and language therapist; FS=fado singers'; NL=naive listeners; M=male; F=female.

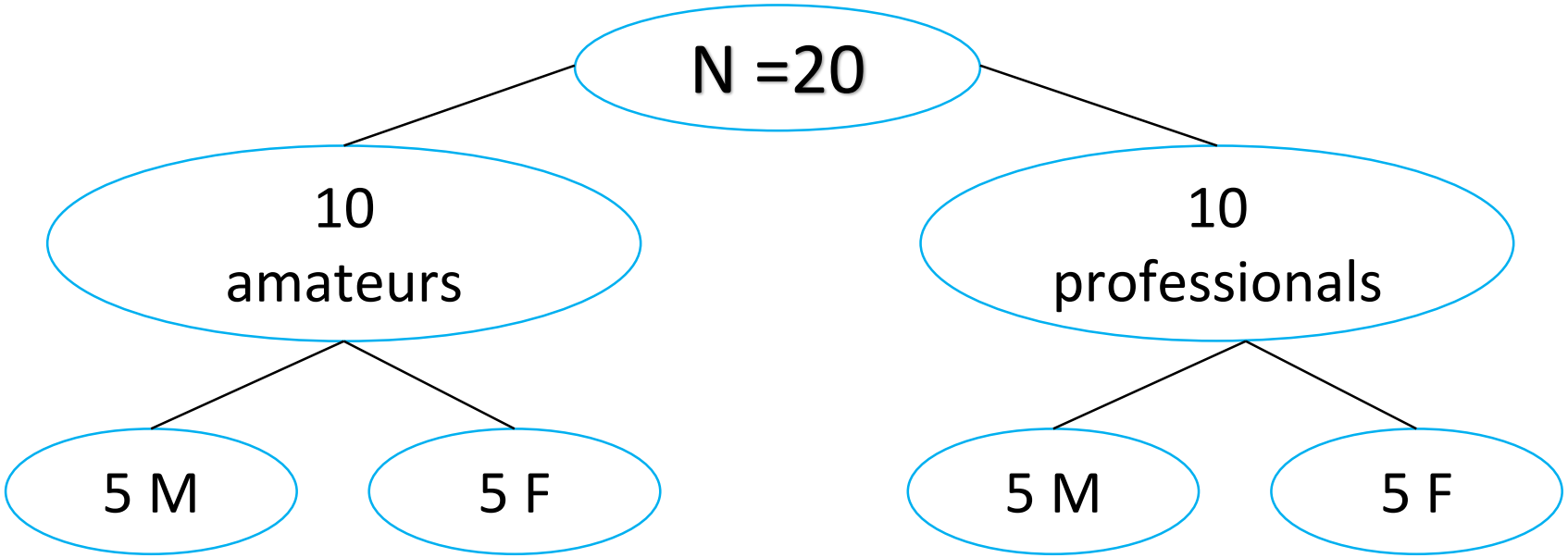
Methods

Judges: Inclusion criteria



Methods

Subjects: 20 singers



Singers: Inclusion criteria

1. Native European Portuguese (EP) speakers;
2. > 18 years;
3. No history of:
   - ✓Voice, speech, and/or language disorders;
   - ✓ Allergic and/or respiratory problems on recording day;
4. Literacy;
5. No knowledge and/or participation on a similar study.

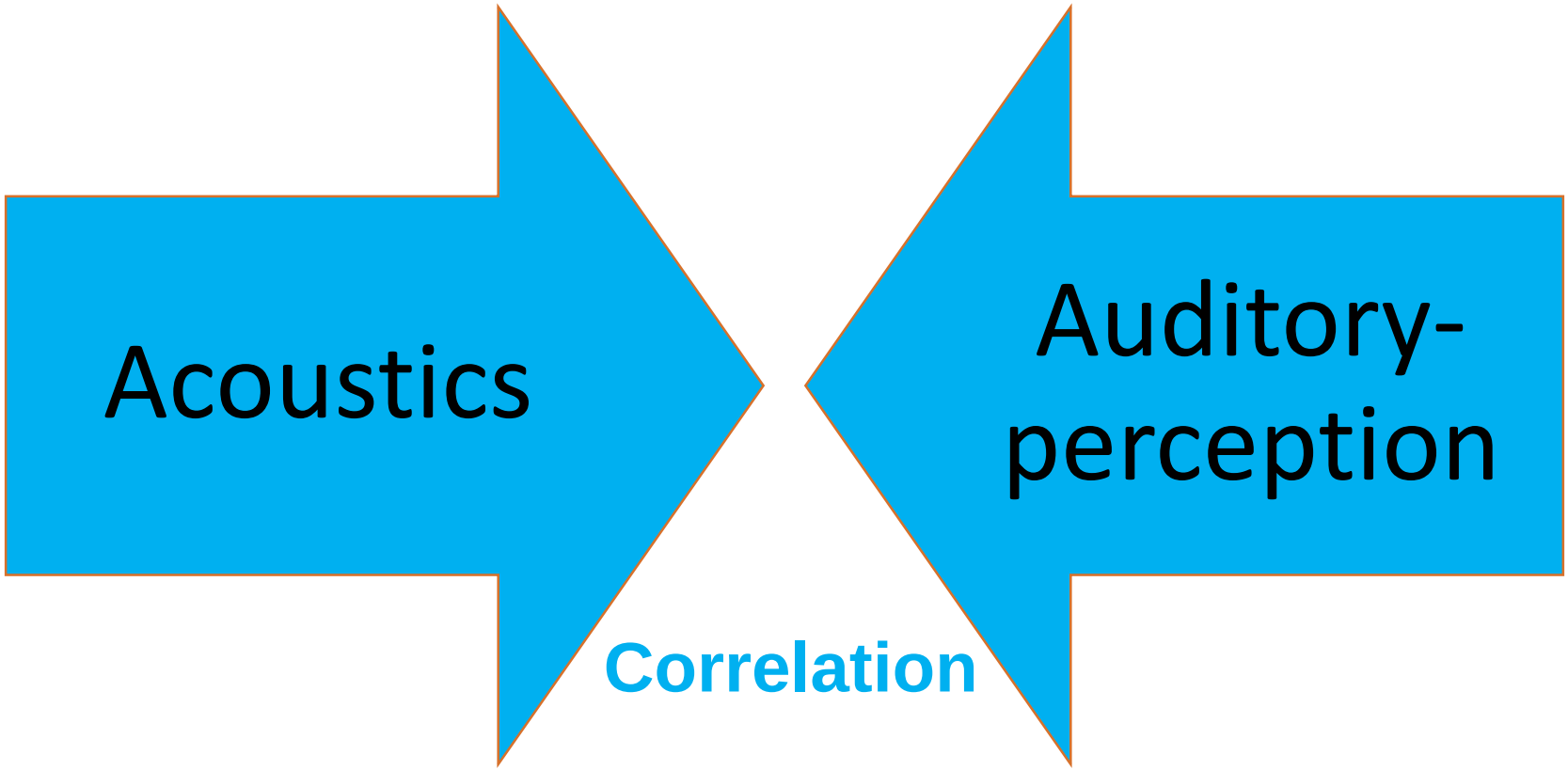
Amateurs vs. Professionals

- Payment for their performance
- Singing education ≥ 1 yr
- ENT exam 1x yr

Methods

Portuguese (original)	English (translation)
“De quem eu gosto nem às paredes confesso. E até aposto que não gosto de ninguém. Podes sorrir, Podes mentir, Podes chorar também. De quem eu gosto nem às paredes confesso”.	Not even to the walls I confess to whom I love Moreover, I bet that I love no one You can laugh, You can lie, You can also cry Not even to the walls I confess to whom I love

Methods: construct validity

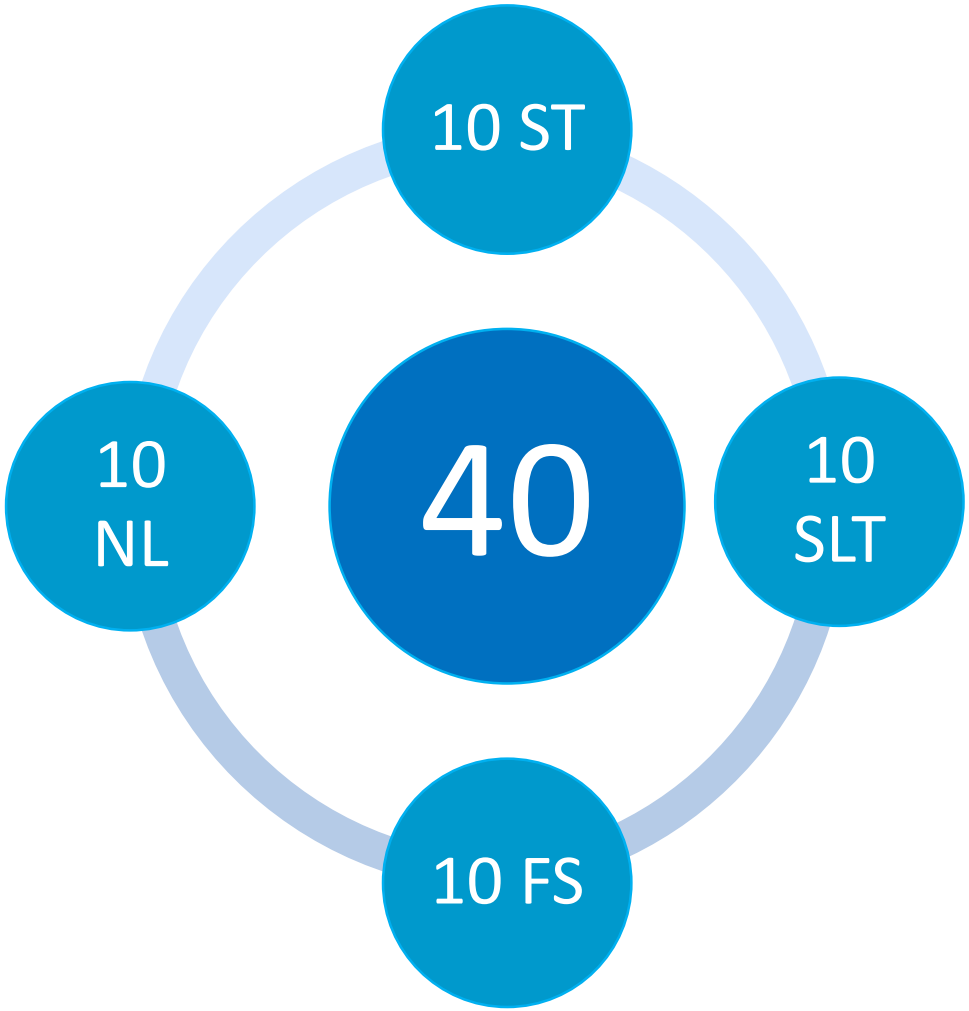


Methods

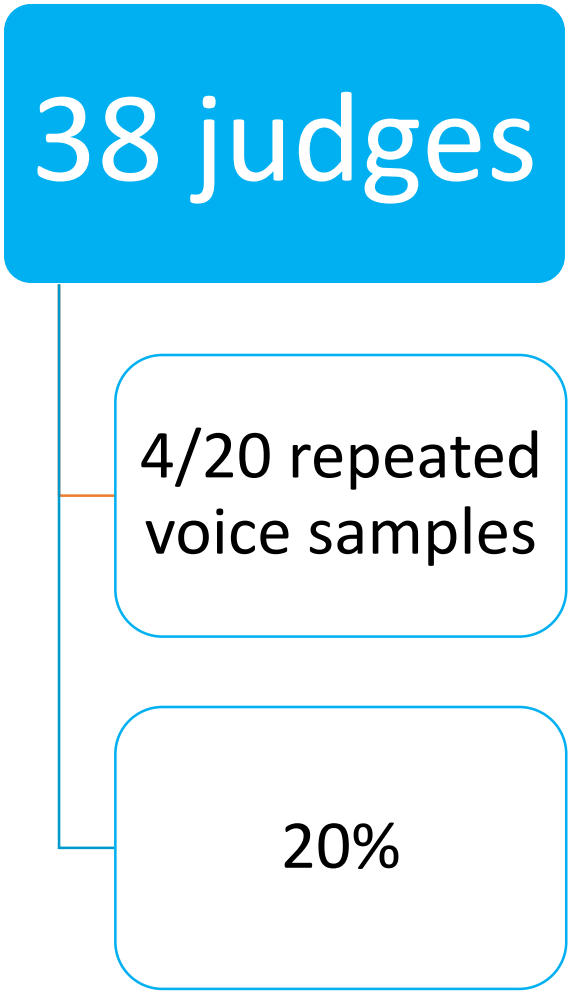
VOCOLOGIA do FADO

Concurrent validity

Methods: inter-judge reliability



Methods: intra-judge reliability



Methods

Procedures: Auditory-perceptual

Informed consent form

Questionnaire

Audiological screening:

3 speech frequencies

Noise environment < 50 dB A

Voice samples in an open field at 70 dB SPL

Methods

Procedures: Acoustic

Informed consent form

Vocal health questionnaire

Phonatory tasks

Recording equipment

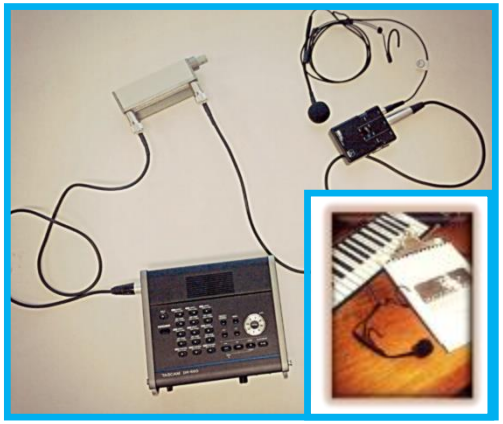
Acoustic analysis

Methods

Advanced vocal function lab

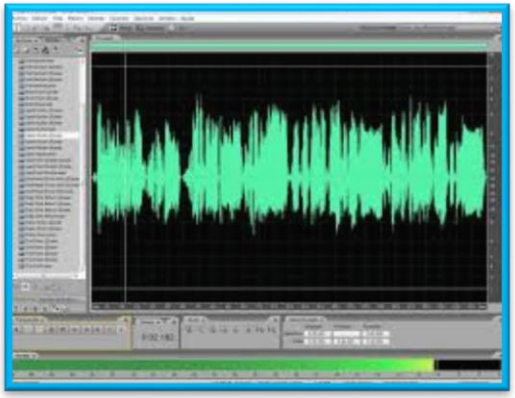
Methods

Equipment: Acoustic



Methods

Equipment: Auditory-perceptual



Methods

EAVOCZ Parameters

A.1.Pitch

A2. Loudness

B.1.resonance

C.1. Phono-respiratory coordination

C.2.Articulation

D.1.Roughness

D2. Breathiness

D3. Tension/Asthenia

Methods

EAVOCZ parameters (2)

E.1.VOICE PROJECTION
E.2.VIBRATO
E.3.TIMBER
E.4. EMOTIONAL EXPRESSION
E.5.TUNING
E.6. GLOBAL VOICE APPRECIATION

Methods

Statistical analysis

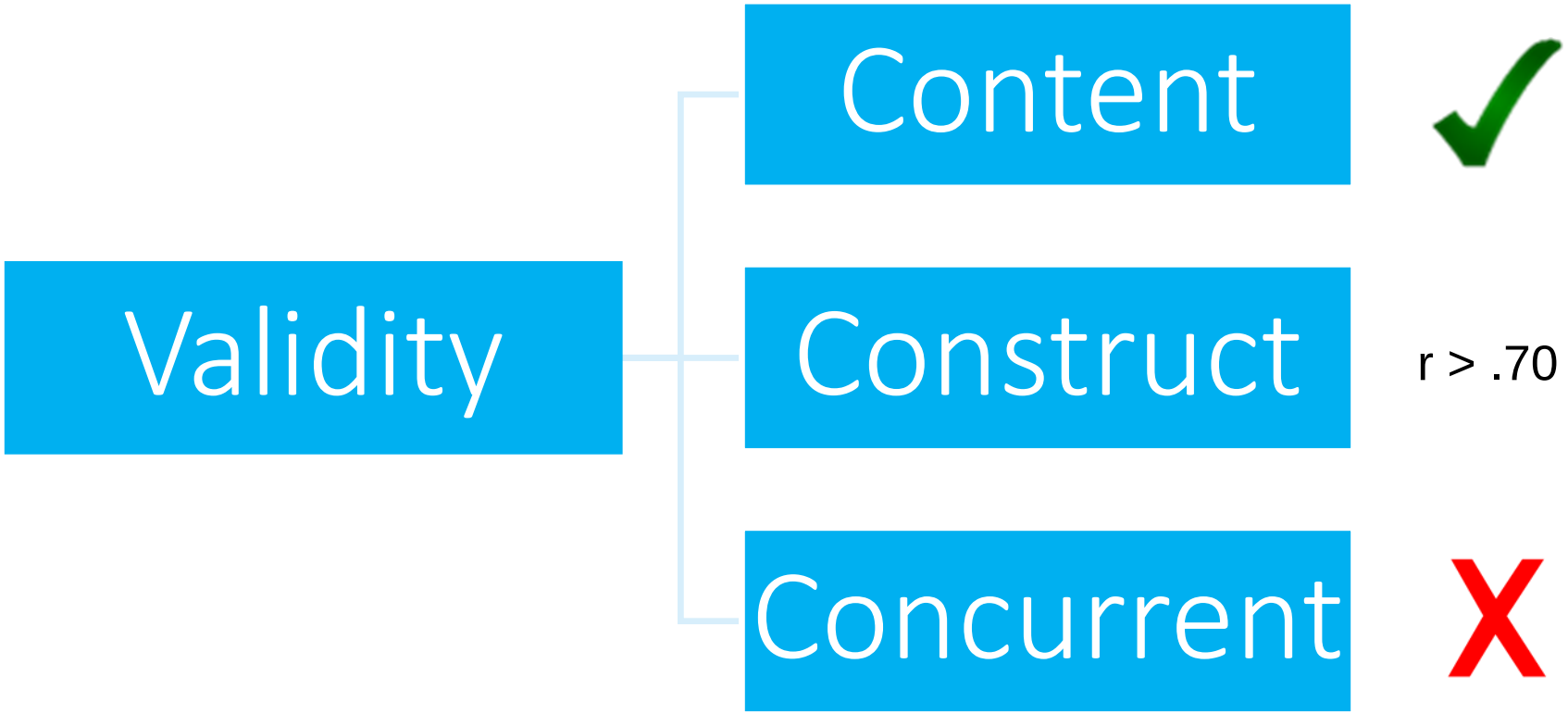
SPSS 22		
Validity Construct	Reliability Inter-judge	Reliability Intra-judge
Pearson Spearman correlation	Intraclass Correlation	Pearson correlation
r > .70	ICC > .70	r > .70
800 judgments		

VOCOLOGIA do FADO

Results

Results

Validity



Results

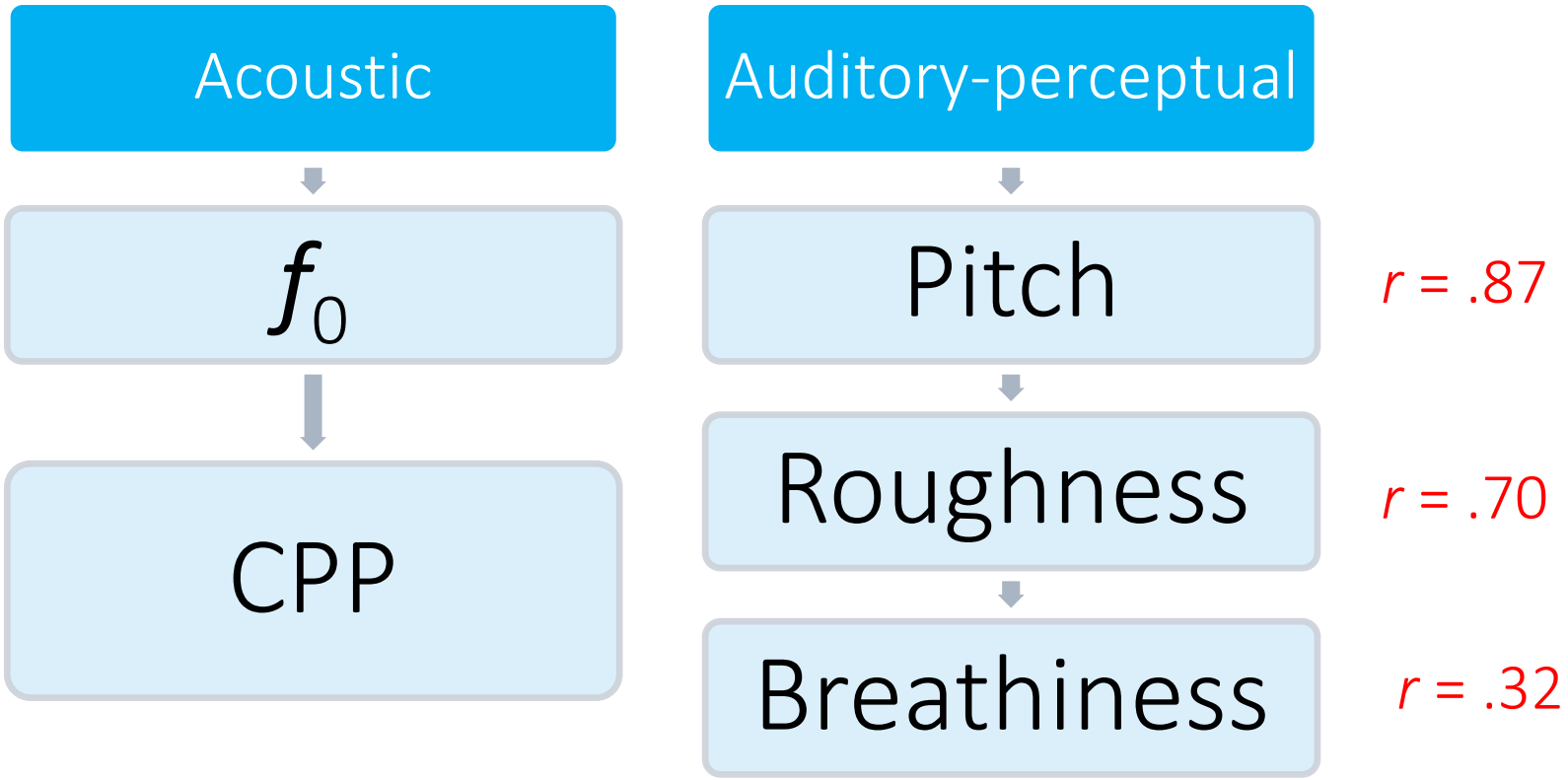
Content validity: Thematic analysis of singing scales

AP parameters	1.	2.	3.	4.
Vibrato	✓	✓	✓	✓
Resonance	✓	✓	✓	✓
Ring	✓	✓	-	✓
Pitch	✓	-	✓	-
Breathing	✓	-	✓	-
Strain	✓	-	-	-
Clarity	-	✓	-	-
Color	-	✓	-	-
Register breaks	-	-	-	✓
Overall	✓	-	-	-

AP parameters	1.	2.	3.	4.
Loudness	-	-	✓	✓
Timbre	-	-	-	✓
Precise articulation	-	-	✓	-
Vocal quality	-	-	✓	-
Vocal onset	-	-	✓	-
Range/tessitura	✓	-	✓	-
Register	-	-	✓	✓
Brilliance	-	-	✓	-
Vocal projection	-	-	✓	-

Results

Construct validity



Results

Concurrent validity

No other European-

Portuguese singing scale

Results

Inter-judge reliability

Vocal parameters		ST	SLT	FS	NL
Roughness		.76	.70	.69	.86
Breathiness		.38	-.50	.54	.60
Tension		.80	.86	.63	.67
Asthenia		.71	.52	.62	.58
Loudness		.86	.86	.79	.82
Vocal projection		.83	.88	.78	.84
Pitch		.71	.69	.79	.85
Tuning		.89	.86	.88	.66
Resonance	Nasal	.52	.45	.64	.49
	Oral	.49	.65	.47	.42
	Laryngo-pharyngeal	.67	.63	.50	.53
Timber		.69	.61	.56	.54
Brilliance		.75	.61	.70	-.04
Emotional expression		.90	.83	.86	.75
Phono-respiratory coordination		.86	.71	.84	.82
Articulation		.60	.49	.83	.73
Global voice appreciation		.87	.87	.87	.79

ST-singing teachers, SLT-speech and language therapists, FS-fado singers, NL-naive listeners.

Results

Intra-judge reliability

38 judges:
4 repeated samples

Roughness

ST+SLT = .79

FS+NL = .75

Asthenia

ST+SLT = .71

FS+NL = .72

Resonance

ST+SLT – Oral = .39

FS+NL – Nasal = .30

Articulation

FS+NL = .37

Conclusion - validity

- Validity

  Content 

  Construct *r* > .70 

  Concurrent X

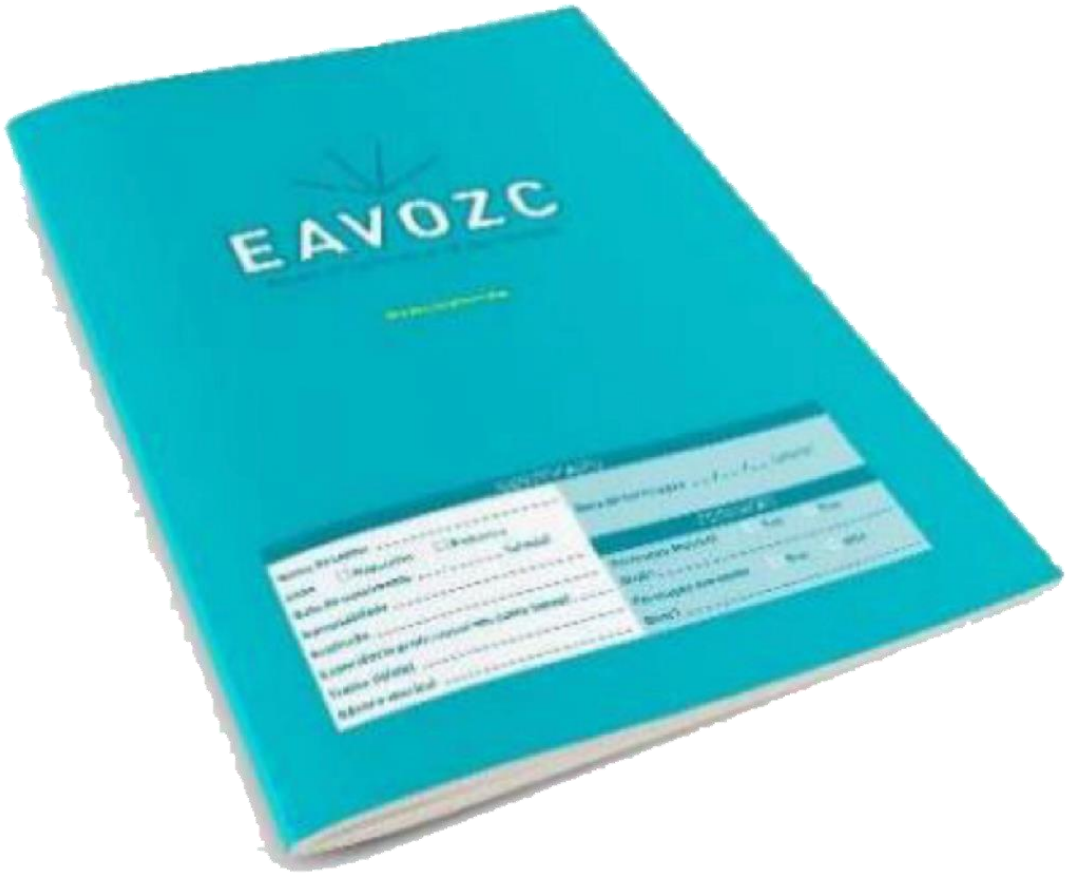
Conclusion - reliability

- Reliability

  Inter-judge $r > .70$ 

  Intra-judge $r > .70$ 

EAVOCZ



Future research

- EAVOCZ english translation
- Validity and reliability on different music styles.
- Concurrent validity using APRIOSV

References

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VOCOLOGIA do FADO

Thank you!

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A. EAVOCZ

A.1. PITCH

Audio-perception of high and low voice. Number of vocal folds' vibratory cycles per second, in singing. It is related with subglottic pressure fluctuation, expiratory airflow and mass, tension as well as elasticity of the vocal folds.

A.2. LOUDNESS

Audio-perception of weak and strong voice. This vocal folds' sound propagation results from subglottic air pressure and expiratory airflow as well as the duration of close phase of the vocal fold vibratory cycle.

B. & C. EAVOCZ

B.1. RESONANCE

Resonance structures usage in a balanced or predominant way (nasal, oral and laryngo-pharyngeal structures).

C.1. PHONO-RESPIRATORY COORDINATION

Activation and coordination of the respiratory and laryngeal muscles used in singing.

C.2. Articulation

Complete intelligibility of consonants and vowels. Motor sincronization of structures used in articulation during phonation.

D. EAVOCZ

D.1. Roughness

Audio-perception of rough voice. Low frequency and intensity noise resulting from irregular vocal folds' vibration.

D.2. Breathiness

Audio-perception of air scape. High frequency and low intensity noise resulting from incomplete glotal closure and excessive airflow.

D.3. Tension/asthenia

Tension: Audio-perception of voice with effort. High frequency and low intensity noise resulting from increased tonus of intrinsic and extrinsic muscles.

Asthenia: Audio-perception of weak and tired voice. High frequency and low intensity noise resulting from decreased muscle tonus associated to incomplete glottic closure.

E. EAVOCZ

E.1. VOICE PROJECTION

Sound resonance that allows transmission and amplification, overlaping musical instruments. Peak energy near 3000 Hz frequency and 3-5 dB amplitude known as singers' formant.

E.2. VIBRATO

Audio-perception of a stable voice vibration with repeated and rhythmic fluctuations. Voluntary modulation with frequency range 5.5-7.5 Hz and amplitude range 2-10 dB.

E. EAVOCZ (2)

E.3.TIMBER/COLOR

Multidimensional property of sound that **distinguishes sounds with equal frequency and intensity**. The number and amplitude of harmonics as well as idiosyncrasies of resonance are responsible for different timbers. Light and dark timber have enhanced high and low frequencies, respectively.

E.4. EMOTIONAL EXPRESSION

Audio-perception of simultaneous variations of pitch, loudness, resonance, timber, number and duration of speech segments.

E. EAVOCZ (3)

E.5.TUNING

Commonly reported as musical ear. This task involves processing, pairing and reproducing a previously listened sound with a specific range of frequencies.

E.6. GLOBAL VOICE APPRECIATION

Global appreciation of vocal production.